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## **Premenstrual Syndrome Characteristics in Caucasian and Asian Women**

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## Research Article

# Current Opinion in Gynecology and Obstetrics Premenstrual Syndrome Characteristics in Caucasian and Asian Women: A Survey - Based Study in Denmark

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### Abstract

Women of reproductive age present one or more emotional or physical symptoms in premenstrual phase of their menstrual cycle, which is collectively called premenstrual syndrome (PMS). Estimates show that about 5 to 8% of women suffer from severe PMS. This form has been termed as premenstrual dysphoric disorder (PMDD). Diagnostic criteria have been proposed for PMDD. For the purpose of this research work, the term PMS was used to include variants of premenstrual syndrome in general. Common symptoms include but not limited to breast swelling, food cravings, bloating, mood swings and backache. The etiology of PMS remains unclear; but available evidence suggests that genetics and environmental factors may influence the PMS experience and its severity. The present study was designed to investigate PMS experience and characteristics in two ethnic groups of Caucasian and Asian women living in Denmark. An online survey-based methodology was applied to target Asians and Caucasians women (18-55 years) with PMS, living in different regions in Denmark. The questionnaire consisted of 36 questions to cover the required information for the purpose of this study. Regression analysis was applied to find the association between PMS-associated factors and ethnicity. Asian (47) in comparison with Caucasian women (47) presented with higher ratings of several PMS symptoms such as mood swings, depression and food cravings ( $p < 0.05$ ). Asian women were also found with higher rate in digestion problems ( $p < 0.05$ ) and higher rate of cramps and nausea during menstruation and a shorter menstruation period compared with the Caucasians ( $p < 0.05$ ). This study highlighted that Asian women had higher rates of both psychological and physiological factors in relation to PMS. Potential reasons for a difference between Asian and Caucasian women living in Denmark is not clear, and need further investigation.

**Keywords:** Premenstrual syndrome, Psychological factors, Physiological factors, Asian, Caucasian, women, Denmark

**Abbreviations:** PMS: Pre Menstrual Syndrome; PMDD: Pre Menstrual Dysphoric Disorder; GABA: Gamma Amino Butyric Acid; BMI: Body Mass Index

### Introduction

Prospective and retrospective studies collectively suggest that up to 20% of all women within fertile age have premenstrual complaints that can clinically be classified into different forms. Clinically significant premenstrual symptoms are termed premenstrual syndrome (PMS) [1]. Severe form of PMS with specific criteria to meet for

diagnosis was later termed premenstrual dysphoric disorder (PMDD) by the American Psychiatric Association. To fulfill diagnostic criteria of PMS, symptoms must appear during the luteal phase and disappear within a few days of the beginning of menstruation. Symptoms of PMS are usually relieved within 4 days of menstrual cycle onset and do not relapse until at least menstrual cycle

day. Both PMS and PMDD can cause marked functional impairment that can substantially affect daily activities [2]. Most menstruating women experience a variety of physical, psychological, and/or behavioral changes, for example, depressed mood, anxiety or tension, decreased interest in usual activities, difficulties in concentration, lack of sufficient energy, changes in appetite, or food cravings, disturbances in sleep patterns, and physical symptoms such as breast tenderness, and bloating. PMS has been repeatedly reported with a prevalence of about 30-40% in females during reproductive-age. PMDD affects 3-8% of the PMS affected population [2]. PMS etiology is not clear, but several proposed mechanisms have been put forward that collectively present a potential for increased sensitivity to normal hormonal changes and neurotransmitter abnormalities. It is important to note that hormonal changes in affected women are not abnormal, but PMS sufferers are hypersensitive to hormonal changes occurring during the menstrual cycle [3,4]. Neurotransmitter theory is based on the finding that several stabilizing neurotransmitters such as  $\gamma$ -aminobutyric acid (GABA) and serotonin are dysregulated in PMS that can cause the symptoms. This theory is supported by the fact that the symptoms often get better by using antidepressant or anxiolytic medications [5]. Evidence suggests that altered regulation of some neuro-hormones and transmitters such as gamma-aminobutyric acid (GABA) and serotonin might be involved in triggering the PMS symptoms. This has been evidentially supported by evidence that PMS are effectively improved by selective serotonin reuptake inhibitors (SSRIs) such as Fluoxetine, Paroxetine and Sertraline [6,7]. GABA agonists promote anxiolytic properties. Allopregnanolone, which is a metabolite of progesterone, also acts as a GABA agonist. The levels of allopregnanolone are typically low in women with PMS, which thereby emphasizes the role of GABA in PMS [6,7]. Oral contraceptives pills [8] and general pain relievers such as ibuprofen, aspirin or naproxen often are offered to help subsiding some of the symptoms such as the cramps, headaches, and backaches. Having the bio-psycho-social model, an approach towards the PMS has in fact been presented as multi-dimensional treatment strategies and potentially with inclusion of some prevention approaches [8-10].

Considerable similarities between the menstrual experiences of mothers and daughters have been observed in a number of studies. One study emphasizes that familial and genetic factors are important risk factors for PMS symptoms [11]. Furthermore, examination of

premenstrual symptoms in twin females from Australian twin registries, has found a significant evidence for the genetic influence [12]. Besides genetics, environmental factors have also been shown to play a critical role in predicting PMS distress [13,14]. A study performed in a group of college students found that PMS was significantly associated with increase of sedentary life style, exposure to passive smoking, elevated BMI (body mass index), positive family history of PMS and the consumption of the dietary intake in particular consumption of junk food [15]. This study emphasizes on the importance of environmental lifestyle in association with PMS. Evidence also suggests that PMS is a culture-bound manifestation [16] and the degree to which women in different cultures and in different social categories of similar culture may be influenced by PMS varies significantly. In addition, cultural transmission of psychological traits that might influence menstrual symptomatology, such as attitude toward the feminine role (women with female-dominant occupation) may also play an important role [9]. Cultural and ethnic differences in mood fluctuations and alterations in distress and anxiety levels have not been investigated thoroughly in contrast to well-studied physiological aspects of PMS.

There are also individual variations in how pain can be experienced. Ethnic differences in pain perception have been documented in a variety of clinical pain conditions, generally indicating that, for a given condition, this factor influences on the experienced pain characteristics or expressed pain complaints [17]. It has been shown that experience of pain differentially activates stress-related physiological responses across various ethnic groups [17,18]. Numerous studies indicate that there might be a possible link between the PMS associated pain and ethnicity although this subject has not been thoroughly investigated which leaves an open question that whether and how PMS pain is experienced among women with different ethnicities. For example, members of different ethnic groups appear to use differing coping strategies in managing pain complaints or it has been reported that those are less active in health programs and medical visits that might be due to social factors or individual beliefs [17,18]. In a cross-continental study, women in Australia and China were examined for differences in menstrual pain [19]. Australian women rated menstrual pain as more intense, with the duration of pain lasting 36% longer ( $3.0 \pm 2.5$  vs  $2.2 \pm 0.9$  days,  $P = 0.002$ ) when compared with Chinese women [19]. Ethnic disparities might play a substantial role in prevalence, progression, and experience of PMS among different ethnic groups [9,17,20].

With constant immigration, it is not unlikely that some ethnic minorities will achieve majority in the future and this is also substantiated by the young aged females for further distribution. An American study has presented that the likelihood of PMDD increases as the duration of residence is prolonged in the US [21]. This study has proposed that exposure to American culture may elevate ethnic minority women's likelihood for PMDD. Potential contributing factors based on this study has been suggested as stressors associated with ethnic minority life in America, such as discrimination, poverty, pressures to assimilate, etc. Consequently, this calls for awareness of clinicians for paying higher attention to the special risks in this population [21]. There is no study looking into ethnic influence on PMS among different ethnic groups in Denmark. Hence, we aimed at taking initial steps and investigated PMS characteristics in Caucasian and Asian women who live in Denmark. We proposed that differences might exist between Danish and Asian women in terms of PMS patterns.

## **Materials and Methods**

### **Study population**

An online survey-based methodology was used to target women living in different regions in Denmark. The research population was not targeted to any specific number since the goal was to collect as many responders as possible. The minimum number was however considered 100 for obtaining a reasonable statistical power. The survey was open for woman within the age range of 18-55 years, Asians and Caucasians. The study was conducted based on an anonymous fillable questionnaire with no physical contact to the participants; hence, no ethical approval was required. Moreover, no sensitive personal information from any of the participants were recorded that could reveal the identity of the women who participated in the study; therefore, no deviation occurred about the regulation set by the data protection agency in Denmark. These two agencies, however, were consulted about the nature of study and requirement for obtaining approvals, if any, prior to conduct of the study to avoid any potential violation of Danish regulations.

### **Data collection**

A self-administered, structured, anonymous questionnaire covering 36 items was designed for this study. The PMS questions were developed by Metagenics Women's Health Questionnaire and was used to cover the information needed to investigate the participants' premenstrual and menstrual experiences. Data collection  
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was open for one month. The online questionnaire was distributed in several social-medias such as Facebook, Instagram and different portals for women. The questionnaire was developed in Danish language and took in average 15 minutes to answer. To be eligible, the following criteria should have been met: being female at age of 18-55 and living-working in Denmark. The purpose of the study was explained in a short text attached to the link and the women were informed that the participation was voluntary and free. The questionnaire covered information about the following demographic variables: age, females' education status, marital status, ethnicity, marital status, residence, occupation and religion. The participants were then asked about the characteristics of the menstruation: regularity/irregularity of menstruation, interval and duration, female family menstruation patterns in mother and in female siblings if applicable, use of contraceptives, mood fluctuations before/after the onset of menstruation, food cravings before the onset of menstruation, pain during menstruation and degree and location of pain; activity during menstruation; symptoms of PMS whether the symptoms disappear after menstruation and the effects of PMS on their daily life activities (close-ended questions).

### **Data analysis**

The data were evaluated and analyzed in statistical package for social sciences (SPSS) version 22.0 for MacOS. Frequencies and percentages or mean and standard deviation (SD) are presented where appropriate.  $P < 0.05$  was considered statistically significant. Logistic regression analysis was performed to investigate factors associated with menstrual disorders. The qualitative data such as marital status, education status, symptoms, menstrual cycle, and menstrual flow were presented in percentages. The premenstrual and menstrual symptoms were sub classified into 4 groups by the logistic regression i.e., psychological symptoms, physiological symptoms, pain pattern, and the menstrual cycle.

## **Results**

### **Demographic information**

Out of the 148 women participants who signed up for the survey, 107 answered the question about their ethnicity. Out of the 107 the 3.7% ( $n = 13$ ) were African and were excluded from the study since this ethnicity was not of interest in this study. 43.9% ( $n = 47$ ) were reported as Caucasian, 14.0% ( $n = 15$ ) were reported as Asian, 30.8% ( $n = 33$ ) were reported as Middle Eastern and lastly 7.9% ( $n = 8$ ) reported as having mixed ethnicity. Asian group

was then classified as people from both Asian and Middle Eastern background, which therefore gave a total of 44.8% (n = 48) in this group. One of those from the Middle Eastern group did not answer 2 questions regarding the menstrual cycle and was therefore excluded, resulting in 47 participants in the Asian group. Hence, the numbers of the two groups were resulted to be equal. Demographic characteristics of the 94 participants among all ethnicities are shown in table 1. African and mixed ethnicities are not shown in the table.

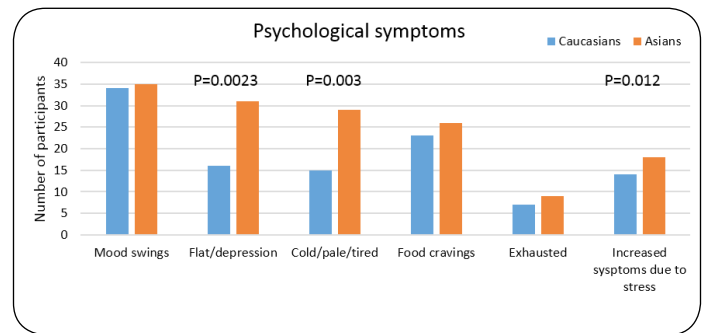
**Table 1:** Demographic characteristics of the women (n = 94) participated in the survey.

Age	Frequency	Percentage
18-24	47	50%
25-34	32	34%
35-44	8	8.50%
45-55	7	7.4
Marital status		
Single	35	37.20%
Married	13	13.80%
Divorced	3	3.20%
In a relationship	43	45.70%
Education Level		
Elementary	7	7.40%
High school	19	20.20%
Profession Education	9	9.60%
Bachelor degree	33	35.10%
College	7	7.40%
Academy	2	2.10%
Master degree	7	7.40%
Phd	1	1.10%
other	7	7.40%
No school	2	2.10%
Children		
yes	18	19.10%
No	76	80.90%
Siblings		
Yes, Female	23	24.50%
Yes, Male	18	19.10%
Yes, both sex	37	39.40%
No	16	17.00%

### Psychological symptoms

Symptoms such as mood swings, flat/depressed, food cravings, increased symptoms due to stress, feeling pale, tired, cold and exhausted were sub grouped as

psychological symptoms. A high proportion of women in the Asian ethnicity group reported the above-mentioned symptoms. Figure 1 demonstrates number of participants from each ethnicity group who presented psychological symptoms.

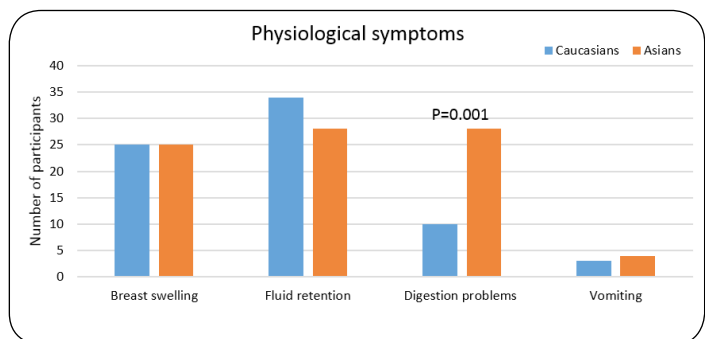


**Figure 1:** Asian and Caucasian women who presented psychological symptoms.

A significant association was found in women with Asian ethnicity group and the symptoms of flat/depressed ( $p = 0.0023$ ), increased PMS symptoms due to stress ( $p = 0.012$ ), and feeling pale, tired, cold and exhausted ( $p = 0.003$ ) compared with women in the Caucasian ethnicity group. No significant association was found in mood swings or food cravings when comparing both ethnicity groups.

### Physiological symptoms

The symptoms; breast swelling, fluid retention, digestion problems and vomiting were categorized in the physiological subgroup. Figure 2 demonstrates number of participants from each ethnicity group who presented physiological symptoms.



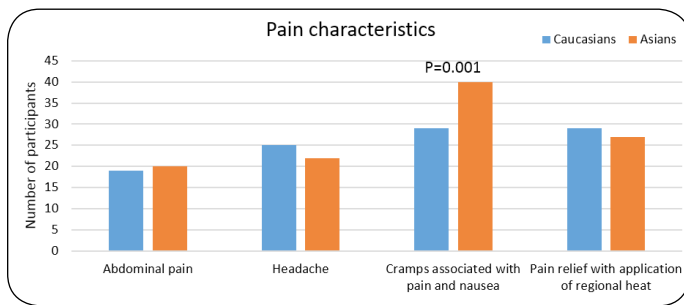
**Figure 2:** Asian and Caucasian women who presented physiological symptoms.

A significant effect of digestion problems was found in the Asian ethnicity group ( $p = 0.001$ ) compared with the women in the Caucasian ethnicity group. No significant

association was found in any other symptoms in either ethnicity groups.

### Menstrual pain pattern

Patterns such as abdominal pain, headache, and cramps associated with pain and nausea and pain relief with application or regional heat (warm blanket) were sub grouped. Figure 3 demonstrates number of participants from each ethnicity group who presented menstrual pain and cramps.

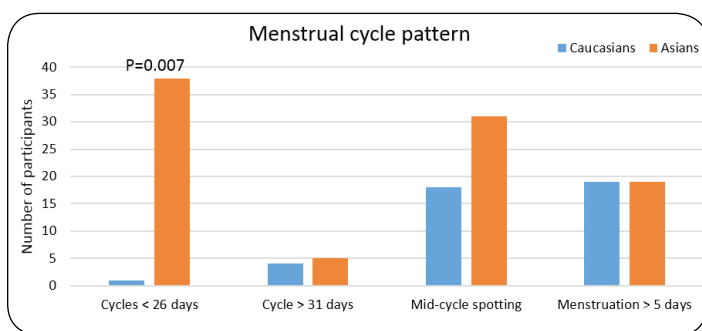


**Figure 3:** Asian and Caucasian women who presented pain with different characteristics.

A significant association was revealed for those factors in the Asian ethnicity group and having cramps related to pain and nausea ( $p = 0.001$ ) compared with women in the Caucasian ethnicity group. No significant association was found for any other pain related symptoms in either ethnicity groups.

### Menstrual cycle patterns

Pattern of menstrual cycle were determined by the following four questions: cycles shorter than 26 days, cycles longer than 31 days, mid-cycle blood spotting, and menstruation lasting more than 5 days. Figure 4 demonstrates menstrual cycle patterns in participants from each ethnicity group.



**Figure 4:** Menstrual cycle pattern in the Asian and Caucasian women.

Asian ethnicity group was found to have cycles shorter than 26 days compared with the women in the Caucasian ethnicity group ( $p = 0.007$ ). No significant association was found in any other menstrual cycle pattern in either ethnicity groups.

### Discussion

PMS influences a significant proportion of women, in which a sub-population is defined, who suffers severely from the PMS symptoms. Reports on prevalence of PMS vary among different studies. One study has concluded that independent from the criteria used and regardless of ethnicity, PMS prevalence ranges from 19% to 30% in women [22]. As for the severity of the PMS symptoms, studies have reported the presence of more than 100 symptoms with varying degrees of severity [22]. A broad spectrum of factors has been considered to underlie this phenomenon ranging from genetic to environmental factors and coping strategies. The present study was designed to explore whether Asian and Caucasian women in Denmark who are to some extent having similar living environment would show any difference in PMS characteristics.

### Psychological symptoms

A high proportion of women with Asian ethnicity in this study reported suffering from mood swings, depression, food cravings and other psychological symptoms prior to their menstruation in comparison with Caucasian women. The present findings are partly supported by the findings obtained in another study where it was found that most of the commonly reported PMS symptoms were food cravings, breast swelling, mood swings, abdominal discomfort, stressed feeling and dissatisfaction with body appearance [23]. This group did not associate their findings to any specific ethnicity group and also it should be noted that they mostly investigated symptoms in adolescent women compared with the present study; therefore, a direct comparison is not possible. We propose that psychological symptoms found in the present study might mainly be due to the bio-psycho-social interaction of different factors emphasizing that differences in cultures might affect expression of emotions and physical approaches towards the disturbed health condition [9]. In fact Anson's study presents that cross-cultural differences exist in attitudes and this would reflect on expression of feelings, opinions, and attitudes [9]. This study found that attitudes towards menstruation and premenstrual experiences were associated with exposure to premenstrual symptoms in

women family members and negative messages during their adolescence. This finding indicates that ethnicity may not have a direct impact on the psychological symptoms of PMS but the culture from which the person has been raised in would play an important role. However, this is only a speculation at this time and further in depth studies are warranted to elucidate the mechanisms underlying psychological aspects of diversity in PMS among different ethnic backgrounds.

### **Physiological symptoms**

Evidence suggests that psychological symptoms such as depression and anxiety can influence the development and severity of gastrointestinal (GI) symptoms within a variety of GI conditions [24]. GI symptoms occurring in conjunction with emotional symptoms are common in the pre-menstrual phase [24]. This finding can support our results presenting a significant difference between Asian and Caucasian women with higher digestion problems in Asian women, who also had higher psychological disturbances associated with the PMS. Among other possibilities, it is suggested that Asian group with higher psychological symptoms suffer more from the digestion problems. It could be speculated that psychological factors might influence dietary habits directly or cultural practices affect those indirectly, which are known to be highly diverse in different ethnic groups. However, further investigations are needed to prove this theory.

### **Menstrual pain symptoms**

This study found a significant difference between the experience of cramps associated with pain and nausea in Asian women compared with the Caucasians in Denmark. Since no prior studies have investigated this association, no comparison can be made. However, it could be speculated that the elevated level of this symptom in the Asian group might be due to different coping strategies used in managing pain experience compared with Caucasians [17]. It has been shown that there is an ethnic difference in the use of various pain coping strategies, which influences the pain experience. Some of these strategies are profound in different ethnic groups. Among those strategies to overcome pain and discomfort sport activities, relaxations, religious activities i.e., praying and social support are listed [25]. In addition, it has been known that genetic factors can also determine the severity of pain under certain conditions and studies have demonstrated that for example African Americans are far more sensitive to certain type of painful stimuli [20]. Due to lack of evidence, this area remains with

uncertainties as to whether environmental factors, genetic factors, or both might have an influence on overall menstrual pain experience. However, one should consider that deciphering of the factors is not easy due to the tight bio-psycho-social connection in pain experience. In addition, Australian women have rated menstrual pain as more intense, with the duration of pain lasting 36% longer when compared with Chinese women ( $3.0 \pm 2.5$  vs  $2.2 \pm 0.9$  days,  $P = 0.002$ ) [19]. This controversial finding itself can show the complexity of studying ethnic minorities, in this case Asian, in different geographical locations, in this case Australia and Denmark.

### **Menstrual cycle pattern**

The present results showed a cycle shorter than 26 days more frequent in Asian women compared with Caucasian women. Liu et al. [26], however, demonstrated that Asian women were significantly more likely to have a cycle longer than 25 days compared to Caucasians (with a menstrual cycle shorter than 25 days) [26]. This controversy might be due to environmental factors as a potential cause of the observed difference.

Collectively, findings from our study suggest that the Asian women are more likely to be affected by the PMS in comparison with Caucasians from all four investigated aspects of PMS symptoms. However, existing evidence on ethnic differences in menstrual function and PMS is very limited; therefore, no direct comparison can be made with the available literature. Nevertheless, few studies investigated ethnical disparities and PMS in general without any sub-classification of PMS based on the ethnic background. For example, Janiger et al. [27] investigated premenstrual symptoms in a number of American outpatients, housewives, and student groups classified to Greek, Japanese, Turkish, Nigerian, and Apache Indians [27]. Their results indicated that all included ethnic groups reported some symptoms of the premenstrual syndrome, having the Nigerian and Turkish women reporting significantly higher severity scores on all aspects of PMS compared with other ethnicity groups. However, they did not include Caucasians that makes it difficult to make a comparison with our findings.

Ethnicity may influence expression of PMS and the severity of the symptoms [28]. Current studies regarding ethnical disparities have been conducted either in western countries or in the Middle East. While an ethnical difference in the experience of the PMS symptoms is being noted, the question remains on how and why this difference may occur and whether or not there

are ways to predict and prevent or limit the suffering. A US-based study has suggested that nativity status, duration of residence in the US, and age at immigration were significantly associated with PMDD among ethnic minority women [21]. Stressors associated with ethnic minority life in America, such as discrimination, poverty, pressures to assimilate, etc. have been proposed as potential underlying mechanisms. Even though some of these factors might be found common factors regardless of geographical location, one must carefully consider several other factors that are unique to each location. Some of the factors proposed by the American study cannot be used to explain differences found in this Danish study. Hence, it is imperative to investigate the prevalence, severity, and most common symptoms of PMS among the various ethnical groups with a goal to improve the quality of life of the women in that certain ethnicity group and to advance the personalized treatment or prevention strategies for PMS with public and professional awareness in continuously growing immigrant societies around the world.

### Study limitations

Immigrants in Denmark are not a large or very diverse population compared with other countries such as USA, Australia, and Canada. Besides, the size of this study is small compared with larger studies in Australia or USA. Hence, the interpretation of results should be made cautiously. Perhaps the small sample size of each ethnical group in this study would not allow generalization of the results, and a larger population-based study can confirm or disprove the influence of the sample size effect. Besides, number of questions for each sub-class of factors associated with PMS may influence the overall finding. Perhaps expansion of number and depth of the questions on psychological pattern, physiological pattern, menstrual pain pattern and menstrual cycle pattern would assist in clarifying this issue. Lastly, it should also be taken into consideration that even though all participants in the present study live-work in Denmark, many may follow their own habits, including diets, coping strategies, etc. regardless of the place. In addition, nowadays, due to high level of mobility for finding a better job or life, it would be difficult to define a pure ethnic population who are only influenced by their local original community practices. Since this study was based on a self-reported survey and no objective measurements were made, the results are solely based on the interpretation of the participants to answer the questions. A future study including personal interviews, genetic tests, and biomarker measurements would definitely assist in further clarification of potential

mechanisms underlying differences seen in the PMS.

### Conclusion

The present study showed some significant differences in PMS experience in the Asian women in comparison with Caucasians. Asian women presented a higher influence of psychological factors, physiological factors, menstrual pain symptoms, and the menstrual cycle patterns in their PMS.

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**Conflict of interest:** None

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